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Renovation of sanitary engineering study programme

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Abstract

While the Bologna process has not been 100 % successfully applied all over Europe and a new reform of higher education system is already in sight, it is crucial to expose examples of good renovation practices which have been applied during the Bologna process. In the article, the authors present a concept, steps and activities carried out in the process of renovation of the study programme Sanitary Engineering at University of Ljubljana, Slovenia. Results of the survey among graduate sanitary engineers and their employers were used as a starting point for the preparation of the content and the concept (4+1) of the renewed study program. Activities (inquiry among graduates, meetings with employers, public promotions etc.) carried out in the process of renovation proved to be optimal for the renovation of this, the field of public and environmental health assurance, very important study programme.

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1. Introduction

A Sanitary Engineer is primarily a health-care professional, who works in the field of environmental health, with the knowledge of how to solve hygienic-technical and ecological problems in the internal and external environment and is trained to deal with hygiene problems in facilities, processes and activities that are important for maintaining a healthy living environment. In their work Sanitary Engineers use epidemiological methods to control infectious and non-infectious agents, are able to think medically and to use an engineering approach in solving problems. In their work they address and prevent adverse environmental impacts on man and the adverse consequences of human activities on the environment. Given the nature of the work it can be said that the sanitary expert is an indispensable member of the society, since people become aware of the importance of the environmental impacts on health and the importance of human intervention in the environment.

The education of sanitary professionals at the undergraduate level in Slovenia began in 1964, initially as a two-year post-secondary programme. Today the Faculty of Health Sciences, University of Ljubljana (Slovenia) conducts a four-year university study program “First Level Degree”, and is in the final stage of preparation for a second Bologna level, leading to the acquisition of a Master’s degree.

Higher education in both Europe and Slovenia has, in recent years, undergone reform in line with the vision of the Bologna Declaration (European Commission, 2010) with a desire for uniformity, creating a common higher

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education area with a credit method of study, the establishment of improved mobility of students and also the comparability of degree qualifications. At the first degree level, Slovenia has maintained a binary system - there are two types of study programme, university and college level, but the sharp dividing line between the two is becoming increasingly blurred. In the second stage, a Master's Degree, is being prepared, which will be directed primarily at a professional level. The third stage (doctoral studies), remains very scientific. With the Bologna Declaration also defining the concept of lifelong learning, it is thus raising the importance of graduate education.

The tendency to build on expert knowledge, fundamentals and the applied research in the field of sanitary engineering have dictated the need for a thorough overhaul of the current higher education study programme of Sanitary Engineering. One of the basic curriculum reform platforms of Sanitary Engineering has certainly been the observance of the fundamental objectives of the Bologna Process. In addition, we were also led by the desire of the transformation to the university study of sanitary engineering.

We approached the curriculum reform carefully and gradually. As mentioned, one of the issues was to ensure compliance with the Bologna reform. In addition, we, in the framework of many meetings, presentations at conferences and public discussions, presented the study programme to students and graduates of sanitary engineering, prospective employers and other professionals.

2. Renovation approach

2.1. Starting point

In the first phase of the renovation process, three surveys among graduates of the present study programme were carried out. In this framework diploma theses were examined and ranked in several categories. We welcomed the fact that research theses prevailed (Fig. 1a), in most cases associated with solving concrete problems in practice (Fig. 1b) (Mahić M., 2009) and not just discussions of theoretical problems.

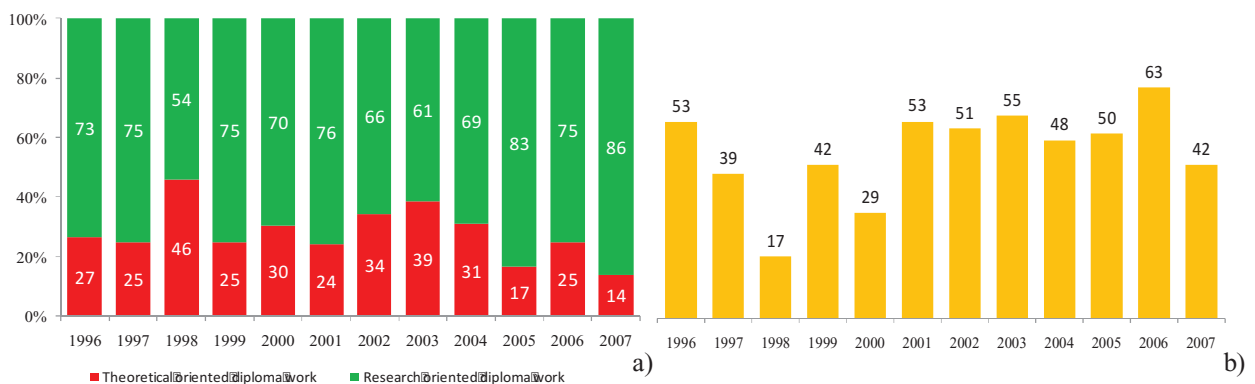


Figure 1. a) The proportion of theoretical and research oriented diploma work over the years; b) The share of the theses work applied in practice

In two studies conducted in 2005 (Turk, 2005) and 2009 (Bagar, 2009) we verified, among the graduates of the four-year study programme in sanitary engineering, employment and the field of employment, their duties, satisfaction of present curriculum content and their usefulness in practice, proposals for improvements and labour self-confidence and satisfaction of graduates in the workplace. In addition to the above, we were, in regards to the second study (Bagar, 2009), interested in the needs of graduates regarding the topics of further studies at a postgraduate level and the level of interest in a master's degree in sanitary engineering.

Turk (2005) notes that the employability of the graduates of sanitary engineering is extremely good satisfied mainly by the fact that 76% of them work in the profession for which they are trained (Fig. 2), which is encouraging and indicates the need for this profile in the labour market.

The study on the applicability of the programme on individual workplace noted differences between graduates employed in public health institutions and public administration. T-test showed a statistically significant difference ($p < 0.001$) in the average grades in the fields of employment. It showed that the content provided to graduates enrolled in the old study programme to be more useful for employees in public administration, probably due to the strong focus in the old course in education for control, slightly less in the direction of prevention, which is compensated in the renovation. Based on the responses we can conclude that most of the graduates support the transformation to the study at university level. The results also suggest the importance of deeper knowledge in specific areas of expertise already during the time of undergraduate study. All these proposals were taken into account in the new study programme with the inclusion of elective courses which were not available in the old (professional level) programme.

A study on the employability of graduates was repeated in 2009 (Bagar, 2009), questions were added to the questionnaire, in which we verified their interest in continuing their studies at a postgraduate level of Master's study in the field of sanitary engineering. Bagar (2009) also finds that more than three-quarters (86%) of graduates employed in the profession for which they are trained and only 2 percent, of those interviewed, were unemployed. These results point to an even better position than the survey in 2005 and suggest that the labour market need for graduates of the study programme of sanitary engineering even slightly increased.

Half of the graduates are dissatisfied with their current education, which is shown by the needs of graduates to upgrade skills as almost three-quarters of students (Fig. 3) are interested in a master discipline, of which more than half are prepared to enrol in a master's degree in the field of sanitary engineering.

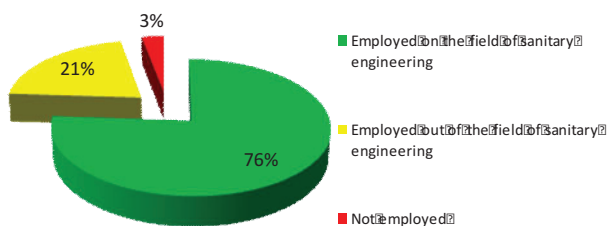


Figure 2: Employment rate (N=181)

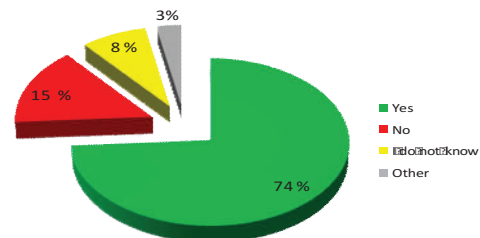


Figure 3: Interest for further study on the second Bologna level (N=238)

2.2. Introduction to the professional public

Based on the results of these studies, we prepared a revised programme which was presented on several occasions to the general and professional public. Thus, it was one meeting in 2004 with representatives of the Department of Sanitary Engineering College of Health in BiH to reform the curricula. In November 2004 programme was presented at a seminar of sanitary engineers in Otočec, Slovenia. In December of 2004 the draft programme was also presented at the 40 anniversary of the education of sanitary experts in VŠZ (College of Health Studies). In the meetings at the Department of Sanitary Engineering at the Medical Faculty in Rijeka (Croatia) and Croatian Association of Sanitary Engineers in Zagreb (Croatia), we presented a draft curriculum on Sanitary Engineering and agreed on the possibility of cooperation. The draft reform study was presented to employees and sanitary engineers in the profession, representatives of the Chamber of Sanitary Engineers and Technicians of Slovenia, potential employers and representatives of third and fourth year students at a joint meeting of the Faculty in March 2006. In May 2007 we launched a professional public paper, entitled University Study of Sanitary Engineering at the 4th Preventive Medicine Congress in Portorož, Slovenia, and the paper entitled "Education of Sanitary Engineers and Slovenia thru the view of the Bologna Declaration" at the first International Congress of Sanitary Technicians and Engineers in BiH. A reformed programme was also presented at the International Conference on Organizational Science Development in Portorož last year.

At all these meetings, the professional public supported efforts to reform curriculum and the creation of university study in a model of a 4+1 (four years of undergraduate university studies of First Degree Level and an additional year for the second Bologna Level).

3. Results

3.1. Concept of the study programme

A revamped university academic study programme Sanitary Engineering represents a significant modernization of curricula content, as well as educational philosophy by introducing modern educational methods. The content of study is designed to give students basic knowledge of science, which is applied in the area of sanitary engineering, how it incorporates ethical, social and legal frameworks in relation to health and the environment. The health content incorporates basic operation of the human body, taking note of the management of biological, chemical and physical agents, the epidemiology of infectious and non-infectious diseases and hygiene, all of which build on the engineering skills to serve in the preparation of technical and technological solutions for environmental and health problems. In renewing the programme, we decided for the model 4+1, based on the following arguments:

Sanitary engineering operates across a wide range of preventive health professions; The first two years of study are designed to accommodate science and medical subjects, which are the basis modules and support a multidisciplinary field; A sanitary engineering graduate must acquire knowledge and be familiar with major aspects of public health, ecology, engineering and administrative law; Sanitary engineers have become fully competent and well-employable in the labour market by acquiring a diploma after a four-year study programme, which also was shown in a study on the employability of graduates of the study programme Sanitary Engineering (Turk, 2005; Bagar, 2009).

3.2. Advantages of renewed study programme

The study programme includes in each of the 4 years 60 credit points according to ECTS (European Credit Transfer System), a total of 240 ECTS. In addition to compulsory subjects (213 ECTS or 88.7%) the programme introduces elective subjects (27 ECTS, or 11.3%), usually within the area of discipline. This will allow the student to select areas to deepen their knowledge - the wish, which was identified during the survey of past graduates. It introduces a new approach to learning and new forms of teaching (case studies, real-time work, work in small groups, working in the selected facilities and processes work, simulations, etc.). The study programme also includes a wider range of professional practice, after the second, third and fourth year (18 ECTS). Training will be held in teaching-led faculty databases under lead mentors. Thematic areas of practical training related to subjects, which students listen to each year and the specialized skills that students acquire through the programme gradually.

3.3. International comparison with other similar study programmes

Sanitary Engineer has traditionally been established mainly in the S and SE Europe. In the European Union in the field of education of such personnel are two overriding concepts - environmental and public health engineer. In a survey conducted by WHO (Regional Office for Europe) found that in Europe the area of environmental health is covered by a variety of experts, of course, depending on the professional development and traditional educational models in specific countries. Among 73 different experts on the list for both the sanitary engineers, civil engineers, engineers, chemical engineering and related engineering professions (Fitzpatrick and Bonnefoy, 1999). We compared the following four study programmes of the Bachelor of Sanitary Engineering programme:

1. Bachelorstudiengang Umweltingenieurwissenschaften, ETH Zurich
2. Environmental Health, University of the West of England, Bristol, Faculty of Applied Sciences, UK
3. Studiengängen Umweltschutztechnik, Universität Stuttgart, Germany
4. Corsi di laurea delle Professioni Sanitarie - Tecniche della prevenzione nei luoghi nell'ambiente e di lavoro, Università degli Studi di Parma - Facoltà di Medicina e chirurgia, Italy

In all four programmes compared to the proposed programme of Sanitary Engineering the first year of study focuses on the basics science. Also, all programmes include ecological and engineering subjects, the difference being in the public health topics (e.g., hygiene, food safety).

The programmes are basically similar, but since each country has different public health issues, they include programmes that are not fully comparable. Each of the professions (Slovenia: sanitary engineer; Portugal: Environmental engineer, Ireland and Greece: Health Inspector, Greece, Ireland, Malta, Portugal, Spain, UK: Environmental Health Officer; Estonia: Environmental Auditor) is based on a specific programme of study within each country (European Commission, 2007). We believe that blind imitation of foreign related study programs would lead to the cancellation of important public health areas in the last 40 years, specifically developed for Slovenia and in practice already well known and used.

3.4. Further development

The primary objective was to prepare a competent study programme. At the same time, we focused on further development, as already mentioned, on preparing the study of sanitary engineering at the second level of Bologna. Studying for a Master's degree will take an additional year after completion of the first degree, students will, according to interest select an academic area in which to further deepen their knowledge with emphasis on risk assessment and risk management.

4. Conclusions

The ultimate objective of the reforms was to prepare a study programme which will give a graduate the knowledge, skills and mindset to operate in hygienic, epidemiological and health-ecology fields and train them for management of hygiene processes in working and living environments and to protect humans against the harmful effects of the environment and vice versa. Students will gain during the study subject-specific competencies, which all arise from the content of individual courses and relate mainly to the: hygienic management of facilities, processes and people; discovering adverse factors on health and the environment; performing measurements and preparation and implementation of measures to remedy situations; conducting of administrative proceedings and administrative acts in the field of environmental health.

With all of the announced changes, it must be stressed that the sanitary engineer has been and remains an expert in the sanitary discipline. Due to new guidelines that companies impose on the self control of hygienic quality of products and processes, thereby reducing the role of external control or shifting the responsibility for product quality on manufacturers the employers will have more graduates employed in the process of internal supervision and further consolidate inspection. The employers have already needed and will continue the help from sanitary experts. In the future, we expect that advantage of the sanitary engineer, partly as a result of the renovation programme of the study, will be shown, especially because other professionals who deal with technical issues of hygiene are few.

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